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AIAA Modeling and Simulation Technologies

Why We Explore Constellation Modeling and Simulation

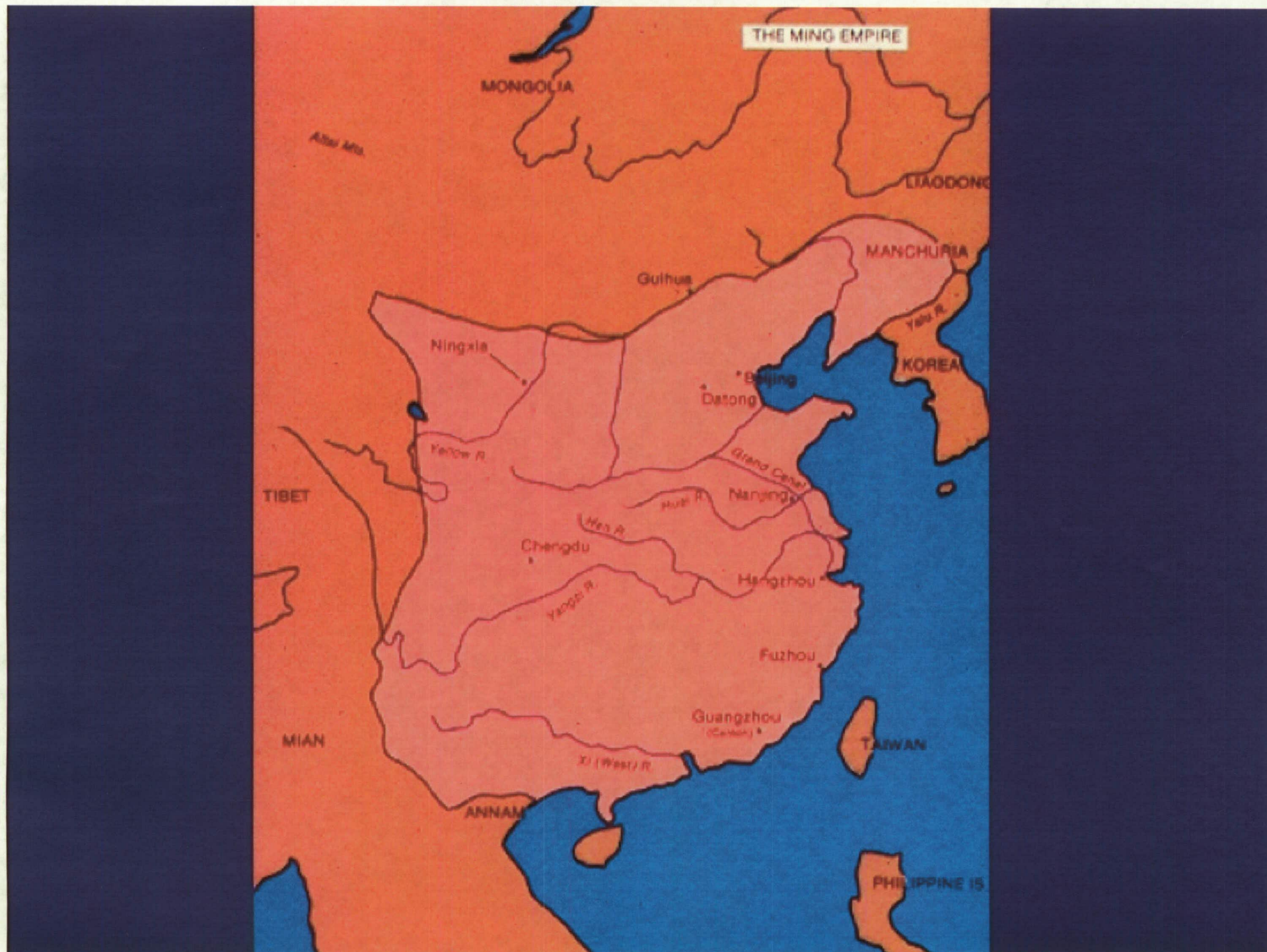
Mike Conroy
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mike.conroy@nasa.gov



Mike Conroy

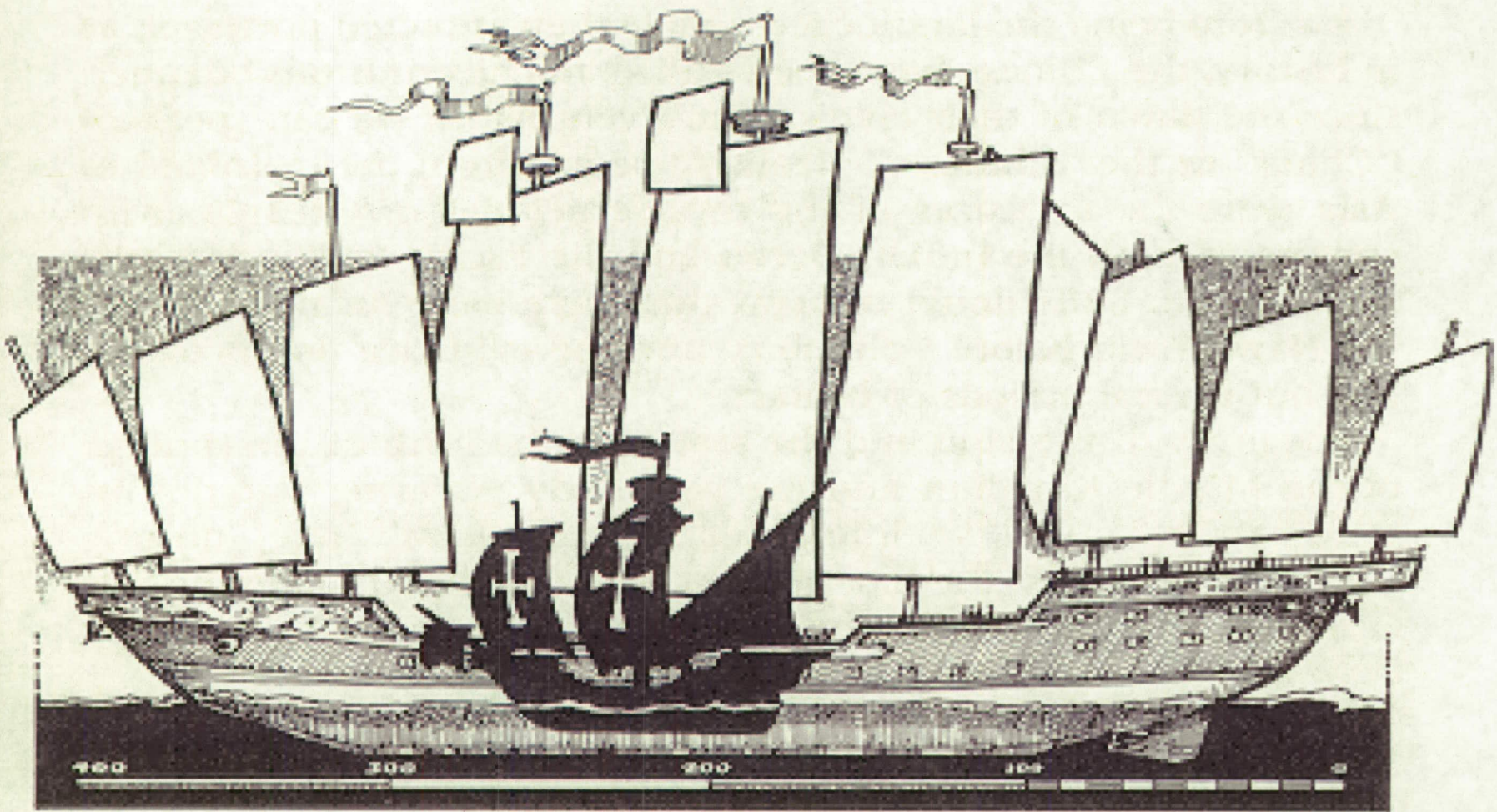
- Born in Orlando, my father was born in Orlando
- Started working for NASA in the late 1960's, Apollo 8 I believe
 - These pictures are from Apollo 14 in 1971
 - Had to finish school before they would give me a badge though











*Zheng He's treasure ship (four hundred feet) and Columbus's St. Maria (eighty-five feet).
(Illustration by Jan Adkins, 1993.)*



A detailed model of a traditional Chinese junk boat, featuring a dark blue hull and numerous tall, rectangular, light-colored sails. The boat is shown from a side profile, highlighting its distinctive structure and rigging.

A MINING TREASURE SHIP
Perhaps 400 ft (122 m) long
and 70 ft (21 m) wide

VALDO DA SILVA S.
SAO CARLOS
Alameda da F. da Republica
12.11.1961

24 1930 Loft Erickson re-sheds
landfill in Newfoundland.

ALL 8000

La 2000 Modeling compares
your data to others in the industry.

4.4.100 Chinese
 4.4.101 Chinese

1990s Chinese junkies
sell off Pleasant Gulf
and Mad Bull assets.

6 JULY-1933 Zhang Ha's fleet sustained the emperor's version of shuttle diplomacy, visiting ambassadors to back allies' countries after stages of several years, while bringing other foreign diplomats back to China.

7 **1920-1933**
The last voyage, in Africa's South coast, with a side trip to Mecca, marked the end of Zheng He's golden age of exploration and of Zheng He's life. He peacefully died on route home and was buried at sea.

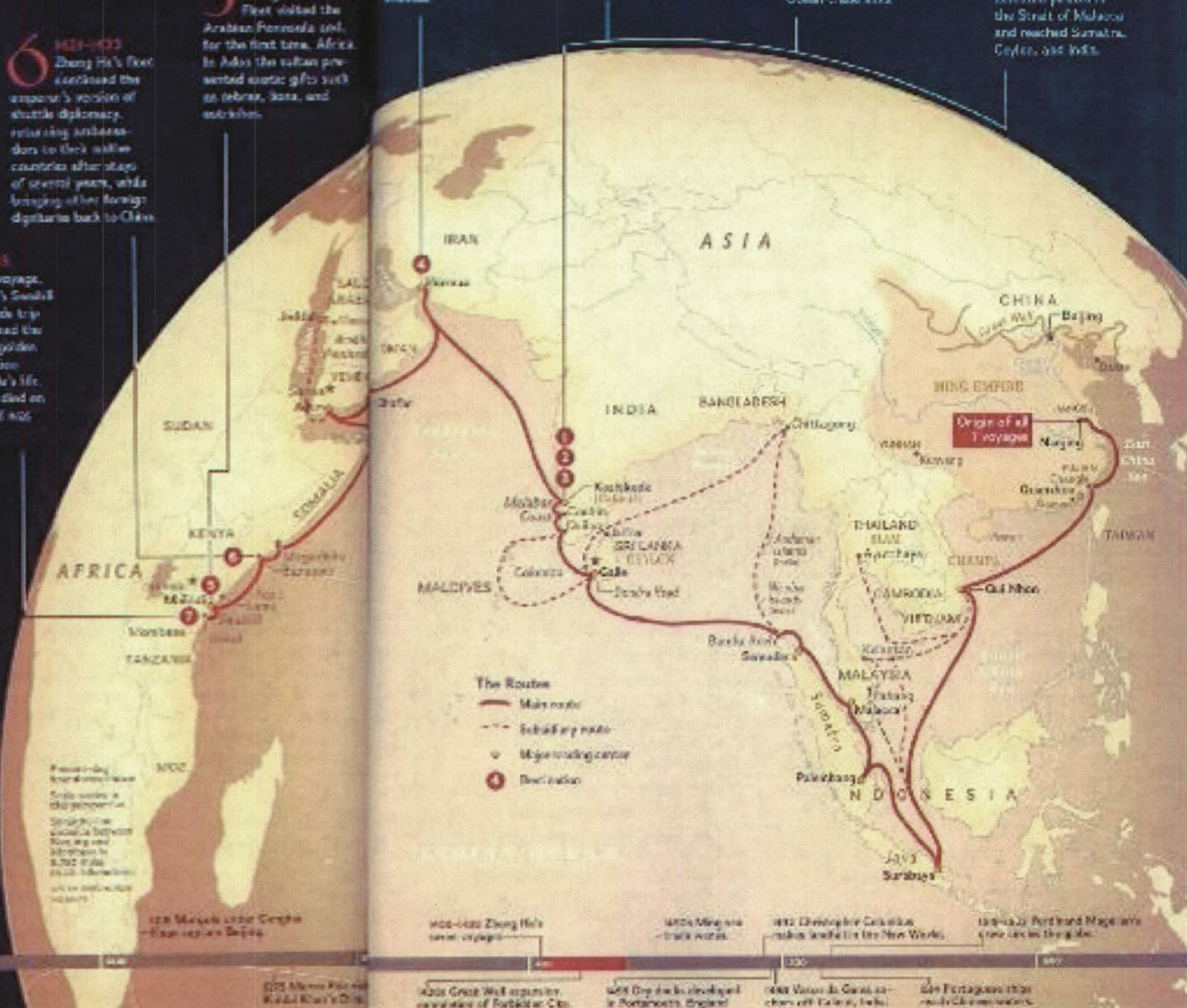
5 **Zheng's Treasure**
Fleet visited the Arabian Peninsula 104, for the first time. Africa is added the various presented exotic gifts such as pebbles, koto, and ostriches.

4 In this voyage's wake, the first to travel beyond India and cross the Arabian Sea, an estimated 10,000 men tribute and voyagers to China, underscoring the Ming emperor's influence overseas.

3 1400s–1410s Although notable for the heroic battle, the voyage was also marked by Minchen Zung's offering of gifts to a Buddhist temple, one of many examples of his conversion.

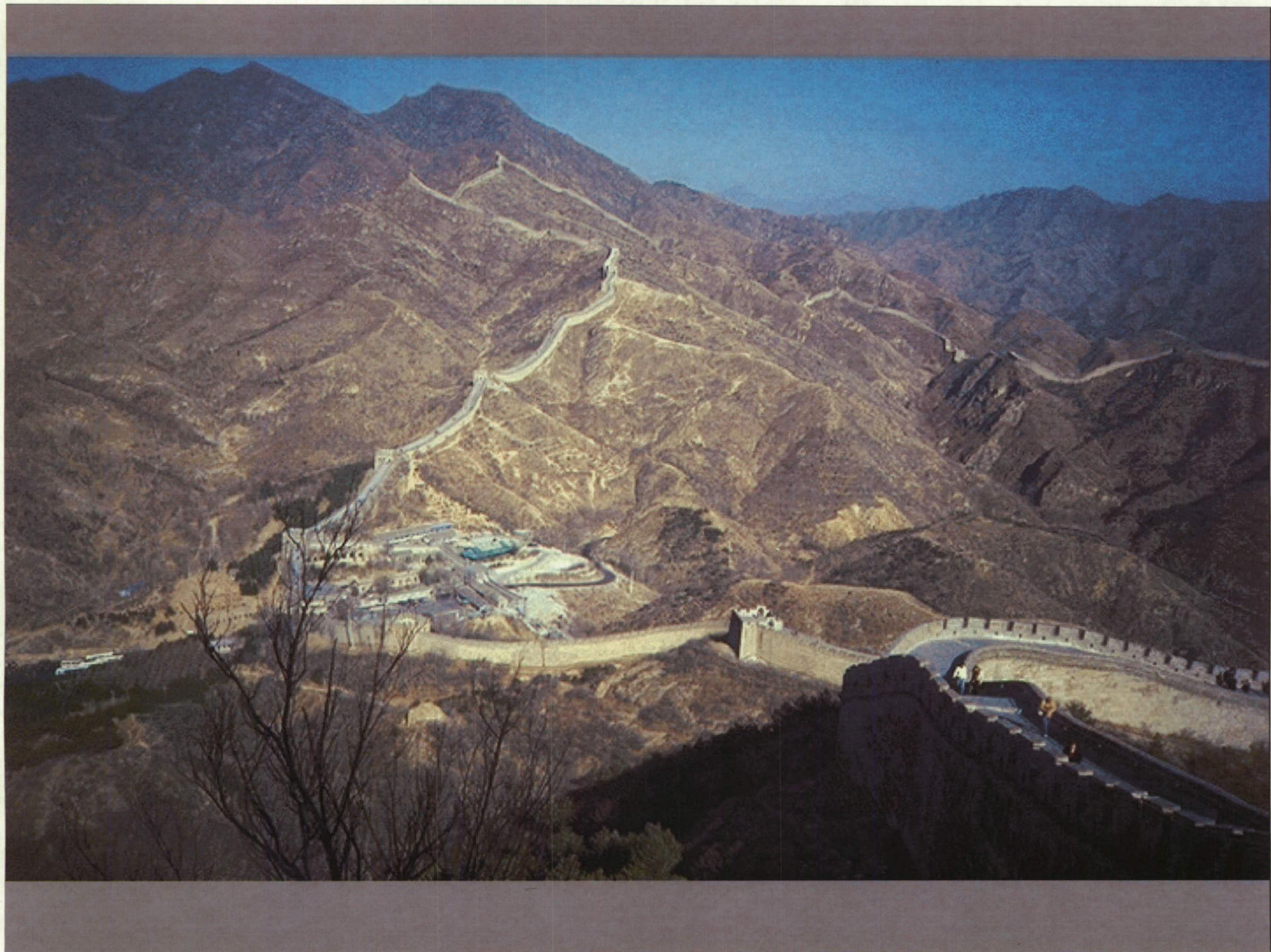
2 1405-1406 The fleet returned to reign ambassadors from Sumatra, India, and elsewhere who had traveled to China on the first voyage. This expedition firmly established the Ming dynasty's Indian Ocean trade links.

1 1495-1507
307 ships
27,670 men
In July the fleet left Nanyang with silks, porcelain, and spices for trade. This well-armed floating city defeated pirates in the Strait of Malacca and reached Sumatra, Ceylon, and India.













Let's Look at the Moon

What do we do when we get there....

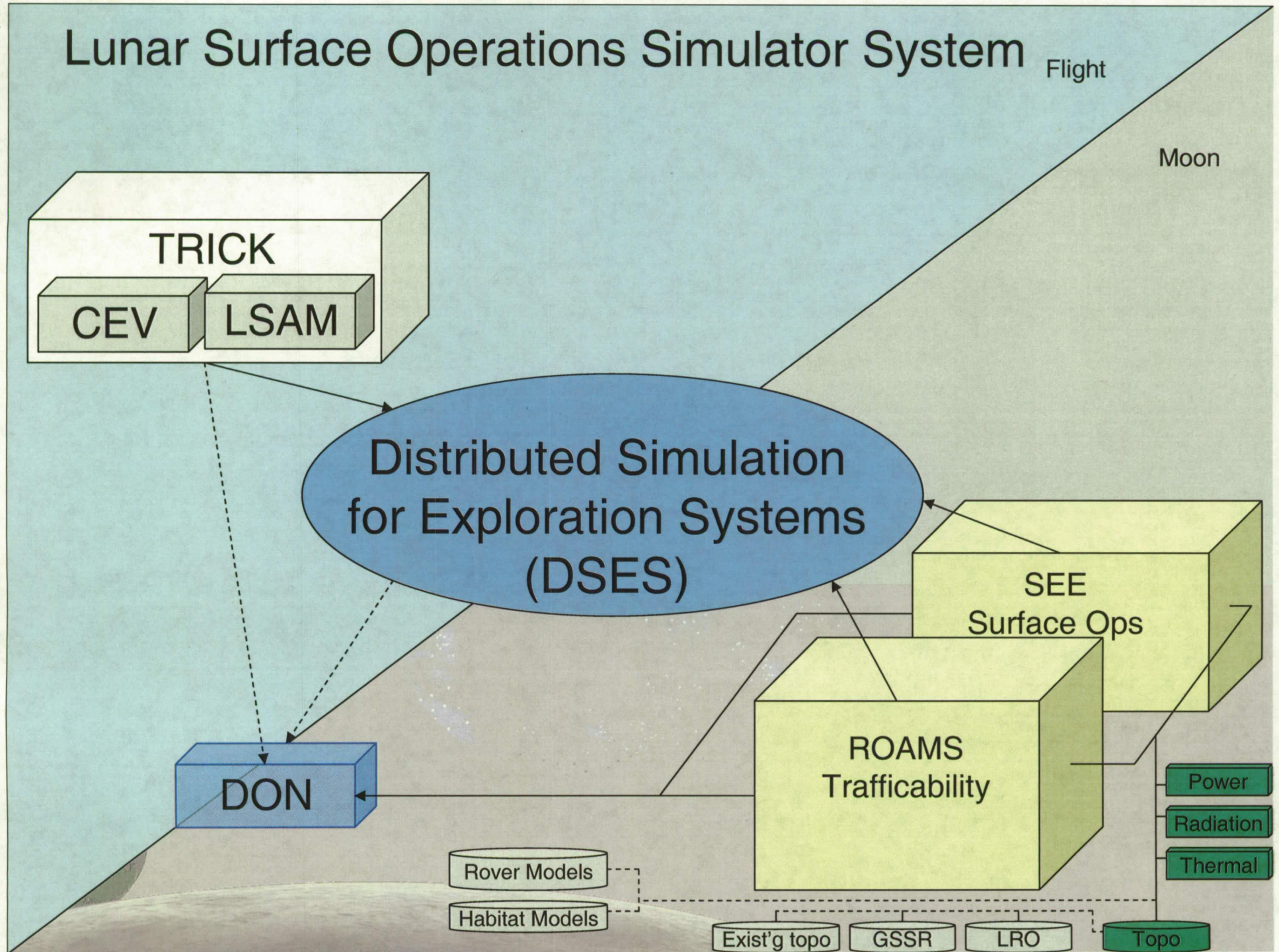
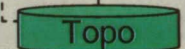
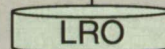
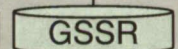
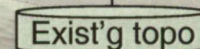
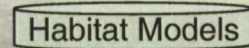
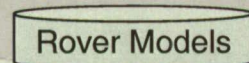
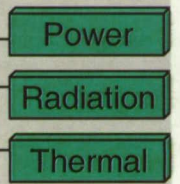
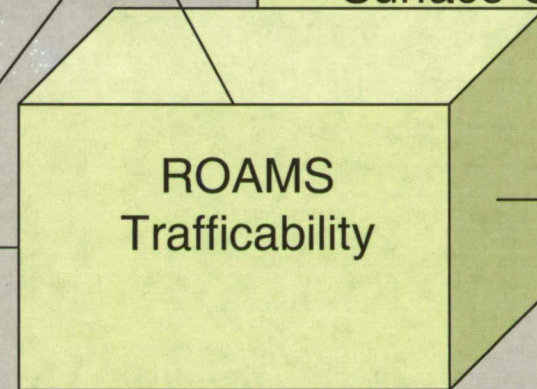
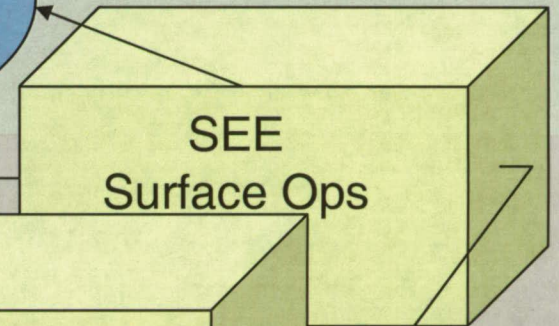
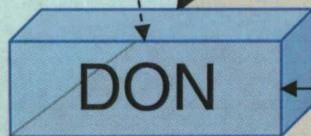
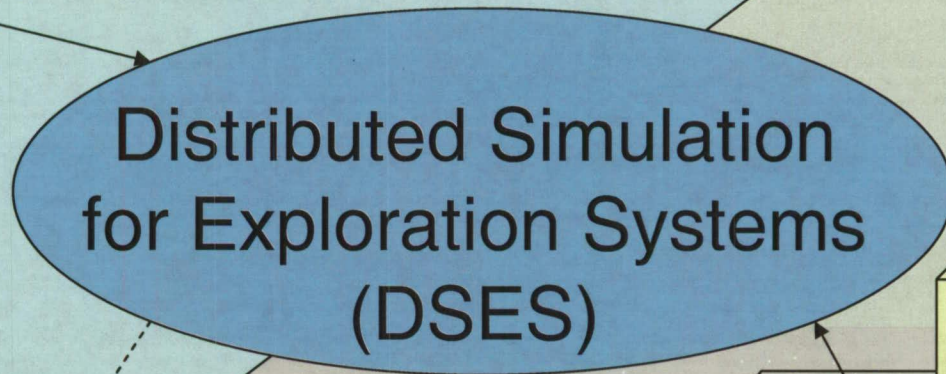
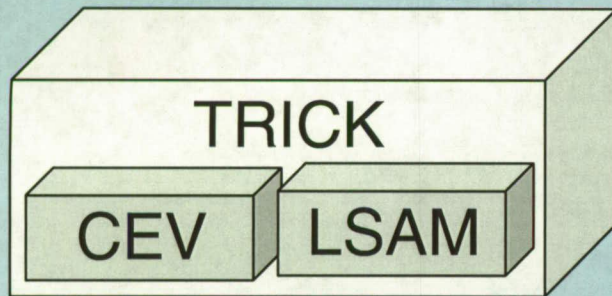
Compliments of Steve Wall, JPL



Lunar Surface Operations Simulator System

Flight

Moon



LSOS In Context: LSOS Tool Role

Example Use Case: Evaluating region for landing or operations based on lighting conditions for a selected time frame and macro-level terrain features

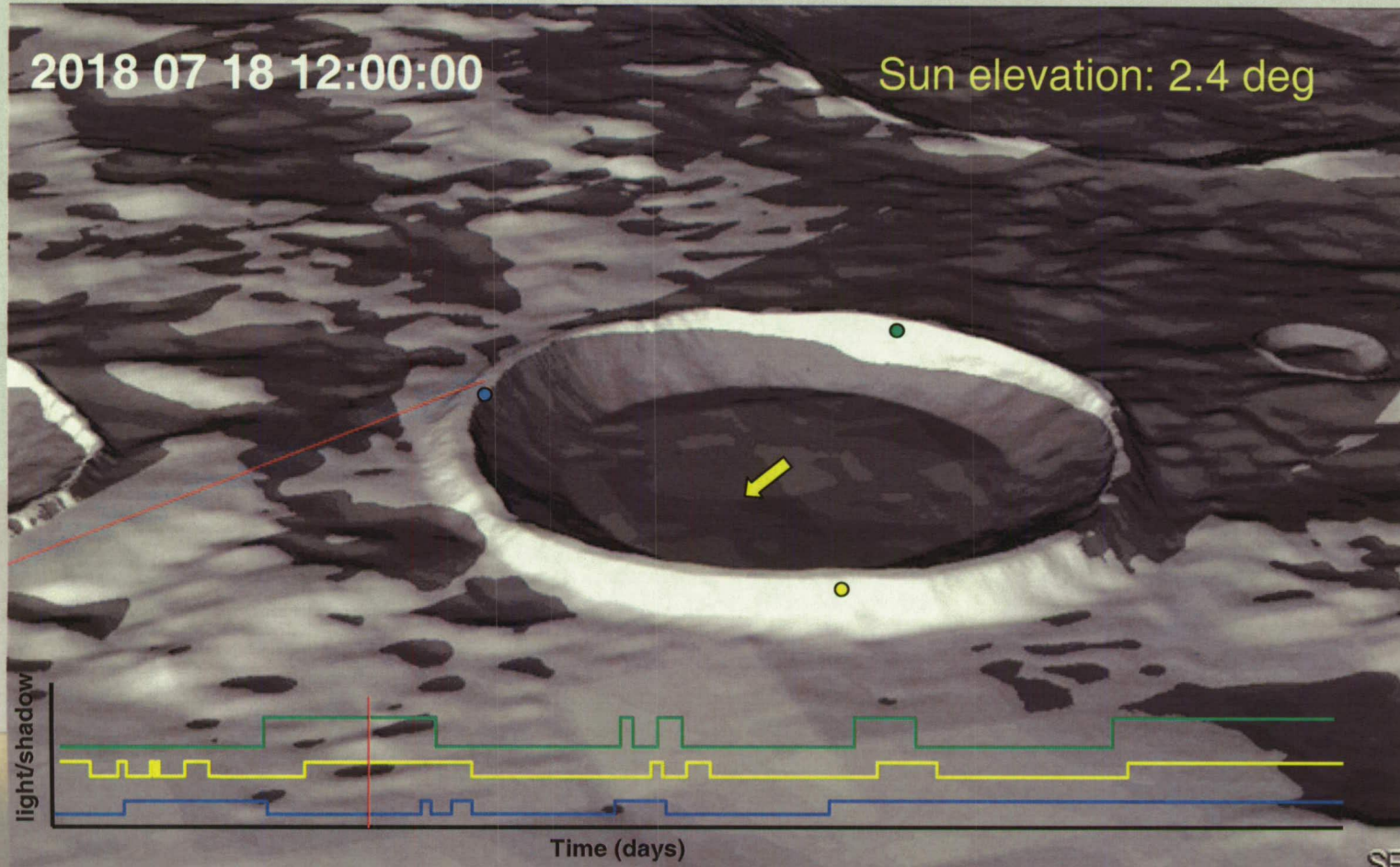
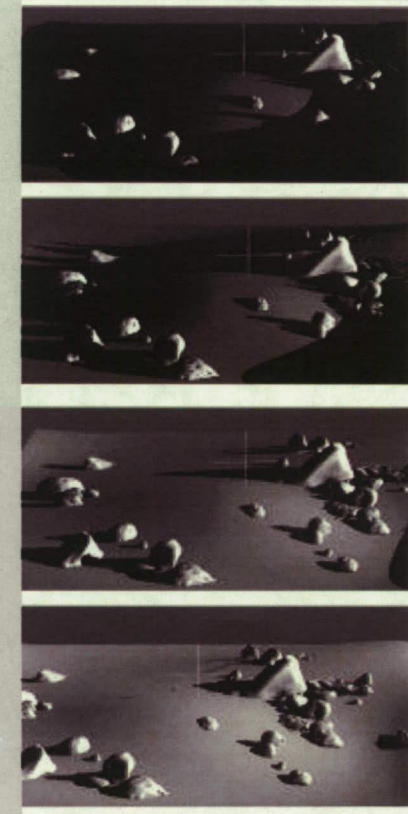


Image: A mockup of a shadow analysis which can be done using the SEE. Points on the surface mesh can be selected for shadowing analysis. A graph shows periods of dark and light. The red vertical line in the graph corresponds to the current frame of the visualization.

LSOS In Context: LSOS Tool Role

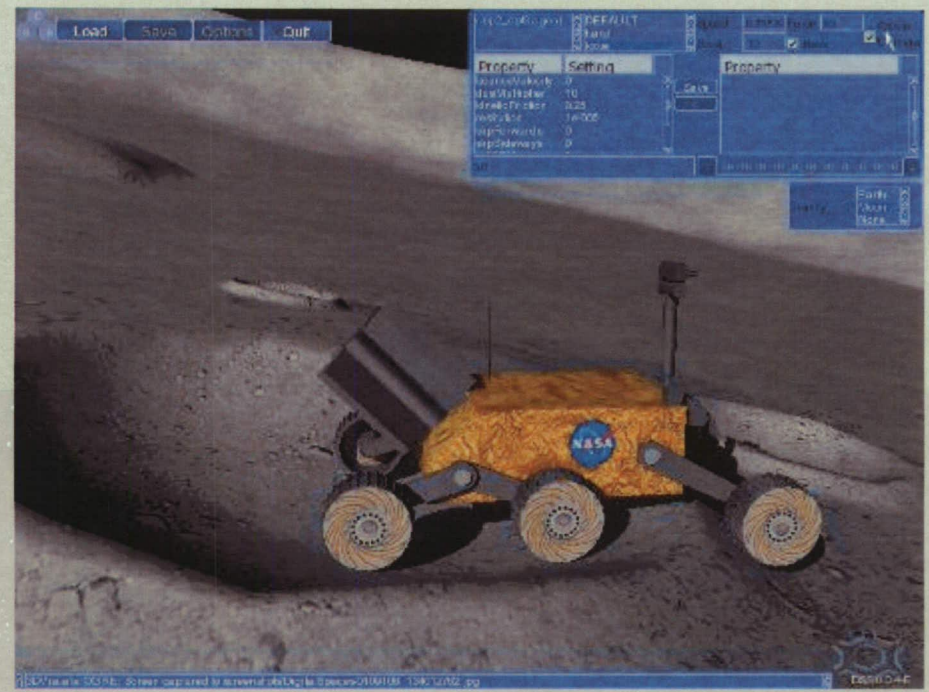
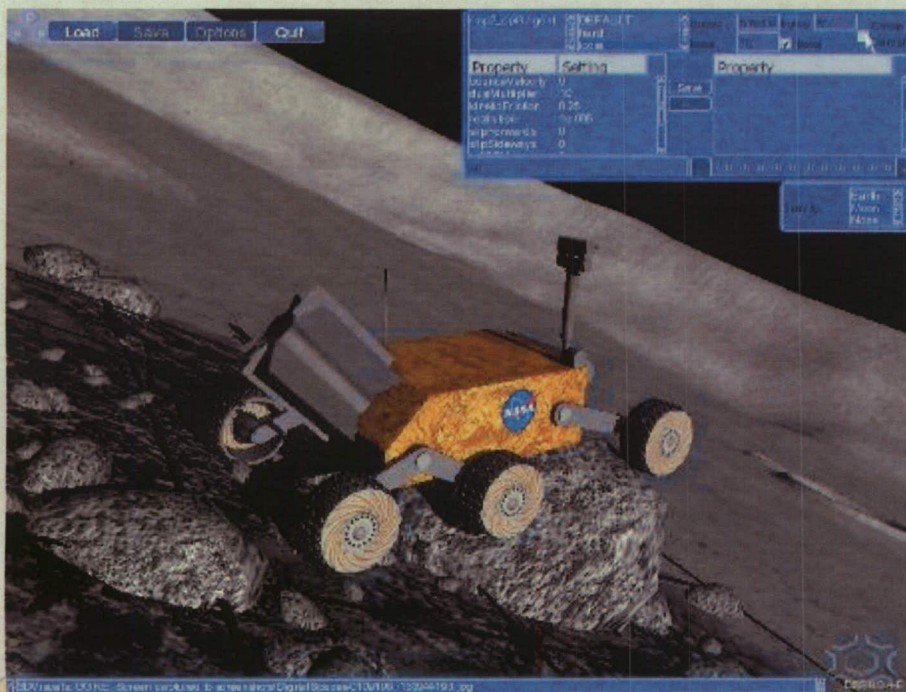
Example Use Case: Evaluating lighting conditions at a desired landing site at a selected time using fine terrain details (e.g. rocks and boulders)



Images: Screenshots from the Shadow Rendering Benchmark Tool developed by the LaRC LSOS team.

LSOS In Context: LSOS Tool Role

Example Use Case: “Trafficability analysis”. Determining the feasibility/resource requirements for a rover excursion over a selected terrain.



Images: Screenshots from the Digital Spaces rover simulator.

LSOS In Context: LSOS Tool Role

Example Use Case: Sortie and super-sortie analysis including subsystems and environment (e.g. radiation)

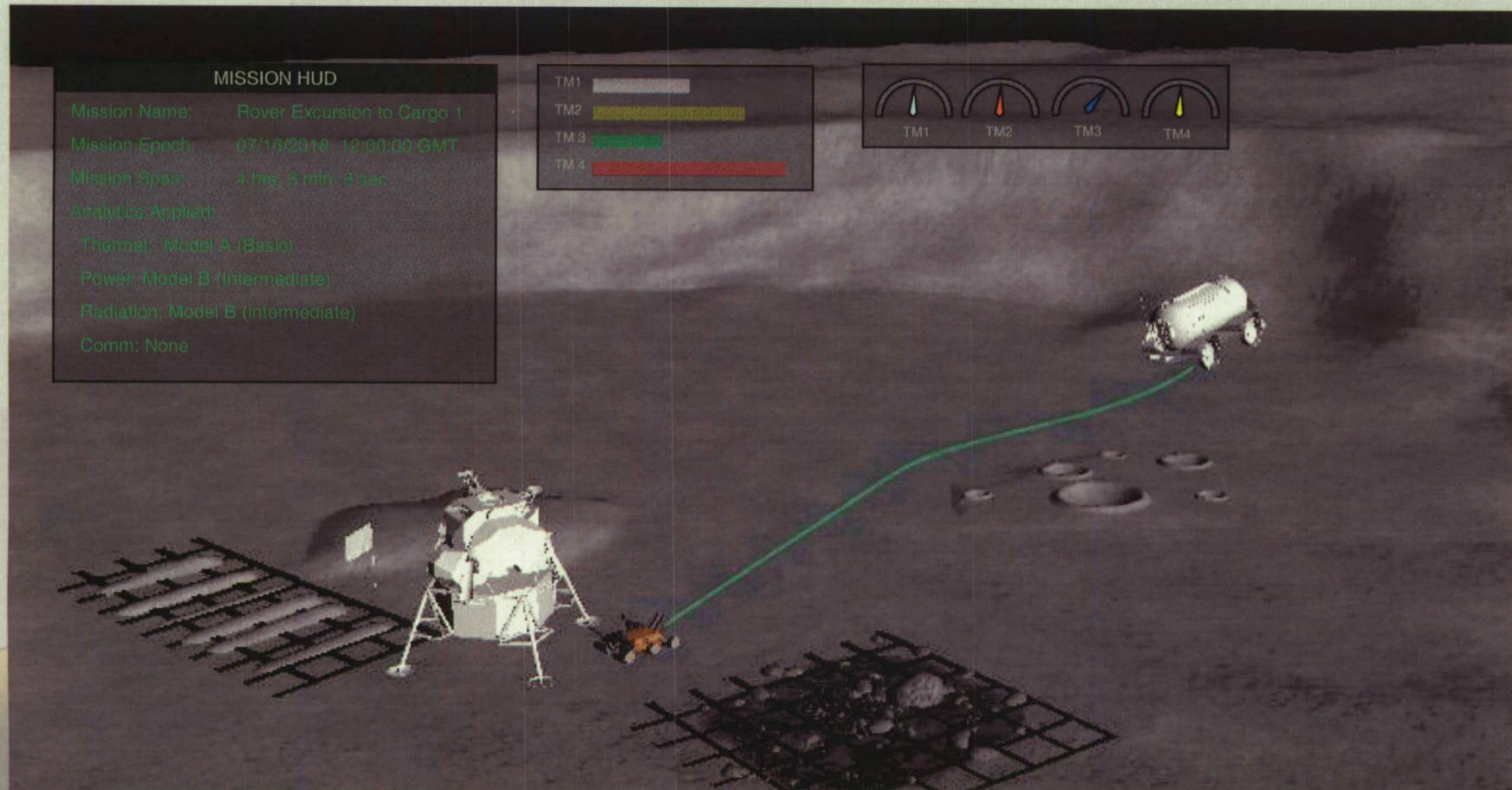
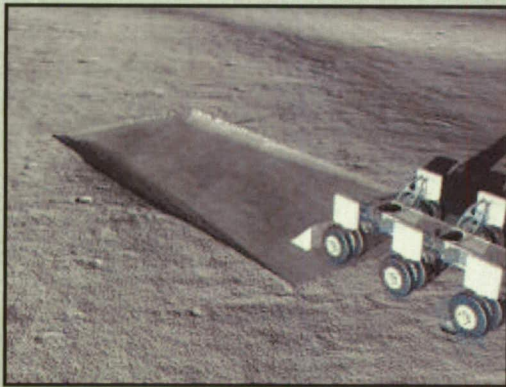


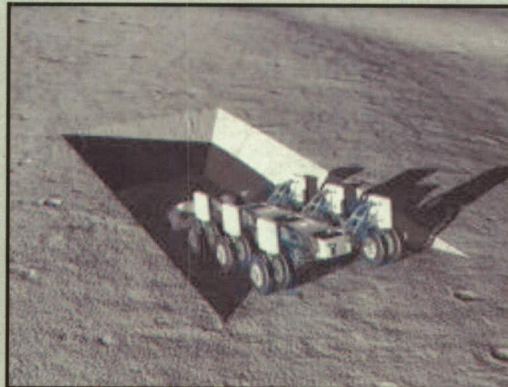
Image: A notional screenshot from the LSOS user interface: a rover excursion between two ground assets.

LSOS In Context: LSOS Tool Role

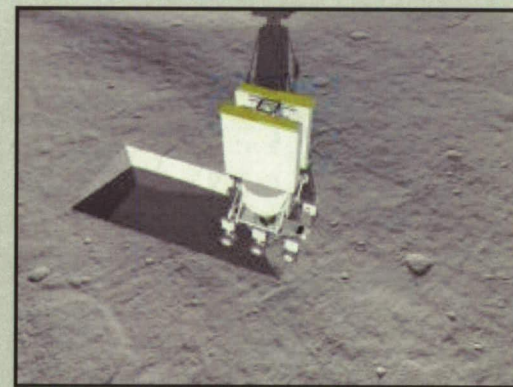
Example Use Case: Deployment and Operation of Equipment



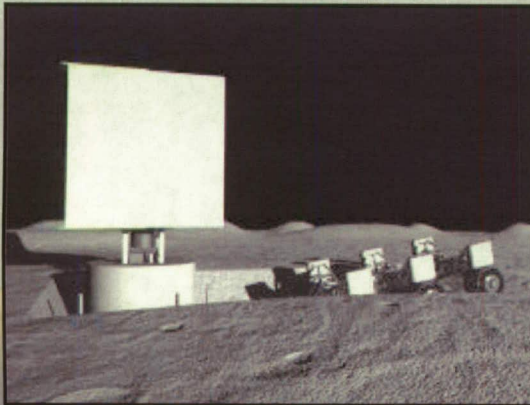
1. Digger prepares area



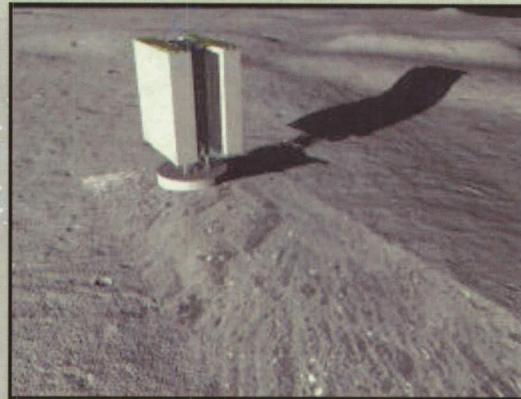
2. Trench depth is reached



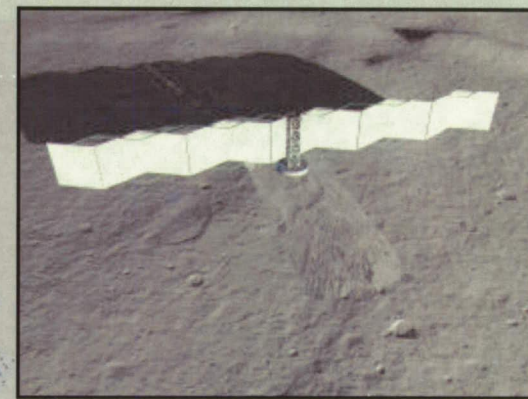
3. Assembly moved into place



4. Digger replaces regolith



5. Lower assembly is buried



6. Panels deployed

Images: Stills from a rendered animation in work by the LaRC SACD Multimedia Lab



"Earth is the cradle of mankind.
But one cannot live in the cradle
forever."

Konstantin E. Tsiolkovsky

